PATENT ABSTRACTS OF JAPAN

(54) FORMATION OF QUANTUM FINE WIRE

(57)Abstract:

PURPOSE: To form the arrangement of a quantum fine wire, having the width of several atomic layers in the same thickness as the stepping of crystal face, in a highly precise manner by a method wherein a quantum well semiconductor layer, which is epitaxially grown, is formed by controlling its thickness and width smaller than the de Broglie wavelength.

CONSTITUTION: The crystal face of a substrate is formed into a face (111)B which is inclined in orientation <110>. As a result, the substrate surface is turned to the face (111)B having a stepping periodically. The side face constituting the stepping is a face (110). In the first atomic layer epitaxy, a semiconductor layer having a wide forbidden band width, which becomes the barrier of quantum well, is deposited. As it is an isotropic qrawing method, the stepping on the substrate crystal surface is in the state as it is. When a semiconductor, which becomes a confinement layer, is coated thereon using an anisotropic crystal growth method, no crystal growth progresses on the face (111)B, and crystal growth progresses only on the face (110) of the stepped part. As a result, a confinement layer, having the controlled atomic column number in lateral direction, is formed in the thickness same as the stepping. In the subsequently conducted atomic layer epitaxy, the barrier layer of a quantum well is formed enveloping the formed carrier confinement layer, and a quantum fine line is formed.
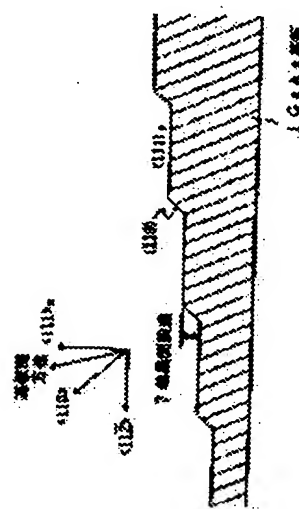
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